

# Freshman Research Initiative Virtual Drug Screening Stream Syllabus Fall 2013

## Course Uniques:

CH 369K TECHNIQUES OF RESEARCH-FRI  
BIO 377 UNDERGRADUATE RESEARCH-FRI

53170 – primary for BlackBoard  
51325

## Stream Principal Investigator (PI):

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WEL 5.266

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## Research Educator (RE):

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PAI 3.04H  
Office Hours: anytime

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## Mentors:

Suman  
Andrew  
Aldo  
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Janice  
Max  
Urvashi  
Brandon  
Daniel  
Michael

## Meeting Times & Class Locations:

Class:  
Lab:  
FRI protein outpost:

**BUR 108**, Wed 2- 3 pm  
PAI 2.14, Variable Times  
WEL 3.270

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## Course Overview

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The fall course for the Virtual Drug Screening stream will be a continuation of the practices which you began in the Spring. The ultimate goal, however, is to now apply your knowledge to discover inhibitors of relevant drug targets. In order to reach this point there are some skills that need to be mastered before making the next step. Consequently, there will be a few lessons in the beginning on genetic cloning techniques to bring you up to speed. Once you have cloned a gene into a suitable vector, you will express it in competent cells in order to produce protein for enzymatic analysis. After obtaining kinetic data from the enzyme assays, potential ligands from virtual screening will be assessed for their ability to inhibit the enzyme target. These inhibitors will then need to be evaluated for their specificity to your enzyme. As the semester progresses, you will become increasingly more independent and tasked with carrying out work on your own. The veteran summer students will have a head start on this process and will be able to commence work where they left off in the beginning of August. Consequently, it is expected that there will be a dissemination of knowledge and techniques from these students to those that are returning from the spring class.

### **Independent Inquiry Flag:**

This course carries the Independent Inquiry flag. Independent Inquiry courses are designed to engage you in the process of inquiry over the course of a semester, providing you with the opportunity for independent investigation of a question, problem, or project related to your major. You should therefore expect a substantial portion of your grade to come from the independent investigation and presentation of your own work.

<http://www.utexas.edu/ugs/teaching/flags>

### **Lab Group Meeting**

The meetings are mandatory. The lecture portions will provide the background for the lab and helpful hints and details on how to perform the experiments, proper use of equipment, and data interpretation.

The meetings this semester will be more like a research group meeting than a typical lecture-based class because we will be having **Journal Club and Research Progress presentations** as well. For journal club, students will present on a paper of interest to the stream. Then, the research presentation will be a progress update on completed work with data and images. For each journal club, there will be a quiz that you answer individually or as group which will be graded as part of your overall grade in the class.

### **Office Hours**

You can make appointments with the RE for help and discussion outside of the allotted lab times. The mentors may be contacted via e-mail with quick questions outside of lab but they are not obligated to spend extensive time in this manner. Consequently, you may be referred to the Research Educator. Dr. Beckham is open for office hours throughout the day in PAI 2.14. Mid-mornings are usually the best time if you want to meet one on one.

### **Prerequisites**

Satisfactory performance in the Spring VDS course AND/OR approval of the Research Educator or the requirements for taking this fall class.

### Course Communication

Announcements, course handouts and protocols will be available via handouts, email or posted on **Blackboard**. <http://courses.utexas.edu> and on **Google Documents** <https://docs.google.com>. We will also use Piazza (<https://piazza.com/>) this semester as a discussion board resource to facilitate sharing of knowledge amongst the students and between the mentors and students. You are expected to check your email on a regular (daily basis) for any pertinent course communication. Face to face, email, text and phone are all acceptable methods of contacting the RE.

Any work that is to be submitted electronically (via email or upload to BlackBoard or GoogleDocs) should have a descriptive filename so that it can be sorted easily. For example, name your file with the following format:

**UTEID\_Name\_Date\_AssignmentName.doc**

e.g. REF289\_RosalindFranklin\_083113\_\_Assignment1.doc

### Websites

The static website for the stream is:

<https://sites.google.com/site/vdsstream/>

However, our day-to-day working site will be a collaborative wiki which will be used to share research progress and information.

<http://vdsstream.wikispaces.com/>

- You will be required to set up an account using your primary email (the same one that you use for the UT system).
- Your user name should include your first name and the initials of your last name.
  - For example: Wolfgang Ernst Pauli would be **wolfgangEP**
  - Be sure to fill in the 'First Name' field when creating your profile so that everyone can see your name
- You will be expected to post to this site throughout the semester to keep the class up to date on your research progress. The wiki material will be part of your overall grade for the class.

### Scheduling

We will keep track of scheduling in the labs by using Google calendar. For the Painter lab, we will use the calendar to show when mentors, the TA or the RE will be in the lab. We may also use it to reserve certain pieces of equipment (e.g. PCR machines) if it gets too crowded.

For those doing protein expression and purification, we will use a different Google calendar that we share with BioBricks stream to show when the biotechnology lab in WEL 3.270 will be available for our use.

Google Calendar for the VDS class

Login: **vdsclass@gmail.com**

Password: **same as last semester**

Access to the lab will be through the key box that is hanging on the door knob. To open the box, get the code from the RE or Mentors. This will allow you access to the key to open the door. Place the key back in the box and enter the code to close the panel on the box when you are done.

The Painter lab should be open from 9 AM to 9 PM every weekday. There may also be some hours on Saturdays and/or Sundays which are yet to be determined. You can only work in the lab if at least one other student that has had the required safety training is present (or a mentor or TA or RE). This is for safety reasons.

The FRI protein outpost will only be available at specific times based upon the schedule for the classes and labs that are normally scheduled for that space. We are allowed to utilize those resources as guests and we must, therefore, not abuse this privilege. The times that we will be able to use the lab will be posted on the Google calendar.

## Course Assessment

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Since this is a lab-based class, the assessment of your effort and understanding will be based primarily upon time spent carrying out research, your lab conduct, lab notebook, presentations, quizzes, mini-assignments, lab reports, a research report on your target and one final report.

### Lab Conduct

You will be evaluated on a few basic principles of lab conduct that all good researchers (and workers in general) should possess: Enthusiasm, Initiative, Follow-Through, Absorptiveness, Synthesis, Writing/Organizational Ability, Cleanliness and Collaboration.

1. **Enthusiasm:** How much desire the student has to learn the topics and apply them.
2. **Initiative:** How often a student proceeds independently on an experiment.
3. **Resilience:** How well the student can deal with and overcome hurdles in research (failed experiments, unexpected results, time management).
4. **Absorptiveness:** How well the student understands the methods and can interpret data.
5. **Synthesis:** How well the student can develop new ideas and implement methods to new problems, design relevant experiments, and test those ideas.
6. **Organizational Ability:** How well the student can keep notebooks, explain or present ideas, describe the data and its meanings (reports), manage time, and express themselves.
7. **Cleanliness:** How well the student prevents contamination and cleans up after themselves. This will be evident in the experimental results and bench area. Be a good lab citizen.
8. **Collaboration:** How well the student collaborates with peers and communicates ideas effectively. This includes accurate descriptions of figures and the procedures they have done.

### Assessed on Time Commitment

In conjunction with your lab notebook, a large portion of your grade will depend upon your hours in lab. You are expected to spend at least 8 hrs a week in lab with most students spending more time in lab (10-12 hrs) . This time includes performing experiments, setting up GOLD jobs, performing DNA analysis, and filling in your lab notebook. This does not include the time it takes to run a remote 20 hour GOLD job or an overnight incubation of bacterial culture! ☺ If you are waiting for a PCR to run and want to count the time, then you should be writing in your notebook, preparing for the next step, researching your target or doing some cleanup. You will be required to fill out your time in lab on the time sheet at the front of the room. A mentor does not need to sign you in and out, this is your responsibility. When you are not in the lab, but rather carrying out computer based work or updating your lab notebook, then make note of your time and add it to the time sheet later. You must specify that this was out of lab time (e.g. 'GOLD work', 'labnotebook', etc.).

Your lab grade will be partially dependent upon how well you cleanup after working in the lab and keeping the VDS supplies and reagents organized. A good habit to get in to is to try and clean at least one thing that is not yours before leaving the lab. This may simply be throwing away

a loose tube on the floor or washing a piece of glassware. As you begin to work in smaller labs, your responsibility will increase and your cooperation will be appreciated even more by other lab members.

### **Being Proactive with Research Progress**

Your grade is also a function of how effectively you utilize your time in lab. A mere presence alone does not constitute effort. As the semester goes on you will need to become increasingly proactive about your research. A crucial aspect of successful research and life in general is to be able to figure out what to do next when you don't know what to do. Research can be very frustrating and one can feel rather 'lost'. The responsibility to figure out and/or ask what you need to do in lab for any given day or week will be upon you. Ask yourself 'What is the next step in my research?', 'What can I do today/this week to get closer to that step?'. For some days this may just be simply sitting down and planning out your experiment and making sure you have all of the reagents and supplies so that you are ready to go the next day to start the procedure.

Research progress does not mean that failed experiments are detrimental to your grade. It is almost a given that there will be things that don't work in research. Your grade is dependent upon your ability to keep trying to solve the problem and also document your efforts in your lab notebook, Wikispaces page, and written reports.

### **Lab Notebooks**

The detail and clarity of your notebook will be very important in conveying your understanding and effort. Furthermore, the quality of your notebook will allow for others to use your research to continue or add to the project in the future. The notebook needs to be updated continuously as you perform experiments. You are required to write EVERYTHING pertaining to experiments in the lab notebook. Graphs, spreadsheet data and images should be pasted into the lab notebook when appropriate. Try to keep a sequential flow to the notebook, but when this is not possible then it is necessary to place page numbers so that you can refer to where an experiment picks up again. Every two weeks the mentors and RE will do a check of your lab notebook to be sure that progress is being made and that the content is up to date. The RE will also randomly examine the individual notebooks through the semester. The lab notebooks will be allowed outside of the lab for when you are doing virtual or computer-based work. However, you must bring it with you whenever you are in lab. Since the notebooks are property of the lab, they will be left with the stream at the end of the semester. It is your responsibility to make duplicates or images of protocols and data you wish to keep.

You will learn that in research, experiments don't always work. Sometimes you might follow the protocol but still not get expected results. In awareness to the fact that science is a process of trial and error, as long as you show that you have learned from these experiences in your lab notebook and reports, then you will succeed in this class. You are expected to understand the theoretical background of the techniques you are using and not just simply carry out the procedures in a blind fashion – mistakes are invaluable in forcing you to appreciate the 'why' of science.

### **Journal Club**

Every 2 weeks or so, the class will discuss a relevant peer-reviewed journal article from the drug discovery research. You are expected to print out the article, read it and bring it to class with you. For each journal club, a 5-10 question assignment will be given to complete before class. Your responses to these questions will be part of your overall grade as well as your subsequent involvement in the journal club discussion. During class a set of questions will be assigned to be completed amongst your group. Effort and completion by the group on this will contribute to your grade.

## **Presentations**

Each student will have to present to the class at least once. This may be a Journal Club presentation, a presentation of a technique that we use in lab, or a presentation of your own research. You will be expected to make your presentation to be about 10 minutes long and be made on Powerpoint or some other acceptable form for conveying knowledge to the class. These presentations will be graded and count towards the final grade in the class. For the individual research presentations, they must include real data and figures. A draft of your presentation should be reviewed by a mentor or the RE a few days before your presentation date.

## **Quizzes**

Throughout the semester there will be a few quizzes to assess your understanding of lab procedures and the journal articles that we will read for Journal Club. These will usually be given at the beginning of class with a 5 minute time limit.

## **Mini Assignments**

There will be a few mini assignments given throughout the semester. The purpose of these is to introduce you to new techniques or refresh previously covered material from the spring. For example, you will learn how to analyze a DNA sequence in preparation for cloning, or you will be given a refresher on Pymol or virtual screening, or asked to write a basic BASH or Perl script. While these are to be incorporated into your lab notebooks and lab reports, they may also necessitate a separate document or file generation (e.g. sdf files). They will usually be 1-2 pages with some images. For the summer researchers that have already performed some of these exercises, a few of these mini assignments will be omitted in lieu of the lab report covering their research progress.

## **Research Report on Target**

A research report will be assigned to allow you to investigate your target in depth before commencing extensive work upon it. This assignment will be more lightly graded than the final report and will provide an opportunity to obtain feedback on your writing. The length will be about 4 pages and in the format of scientific review paper.

## **Bi-Weekly Lab Postings**

Bi-Weekly postings to the research website will be used to convey your progress in the lab and your level of understanding. The posting should include figures/images and include a brief written description of what you did during the week and explain your results (Did your experiments work this week?). Any errors should be detailed in order to facilitate troubleshooting and reduce the chance for the same error to be made by others in the class.

## **Final Research Report**

In place of a final exam, a final research report will be assigned. This document shall represent the cumulative efforts and outcomes concerning your research on a drug target. The final report will be 10 - 15 pages and cover the material more extensively along the outlines of a scientific research paper.

## **Assignment Due Dates**

The due dates for assignments will be determined based upon the research progress of the class. The veteran summer students will be on a different schedule than the rest of the class because of their summer experience. Consequently, a document will be posted to list which assignments are due on which dates and for which group. Late assignments will lose 5% of their graded value per day.

Any work that is to be submitted electronically (via email or upload to BlackBoard or GoogleDocs) should have a descriptive filename so that it can be sorted easily. For example, name your file with:

**UTEID\_Name\_Date\_AssignmentName.pdf**

e.g. REF289\_RosalindFranklin\_092811\_Assignment1BuffersLab.pdf

### **Plus/minus Grading**

The Virtual Drug Screening stream will take advantage of the plus/minus grading system, wherein,

A = 4.0, A- = 3.67, B+ = 3.33, B = 3.0, B- = 2.67, C+ = 2.33  
C = 2.0, C- = 1.67, D+ = 1.33, D = 1.0, D- = 0.67, F = 0.0

However, assignments during the course will be graded on a 10 point system, which will then be weighted by assignment and converted to the 4 point system at the end of the semester to calculate your final grade:

(10, 9.75, 9.5, 9.25, 9.0, 8.75, 8.5, 8.25, 8.0, 7.75, etc..) .

Assignments during the course will be graded on a 10 point system while the final grade is given with a letter grade. Grades may be curved at the end of the semester. You will be assessed on your abilities and effort amongst your classmates and upon your progress through the semester. An 'A' represents exemplary work beyond merely what has been assigned, an 'A-' represents completing everything that is asked in the class and understanding of the material, a 'B+' is for those that have missing or late assignments or are deficient in their understanding. 'B' is for those that have missing or late assignment and are deficient in understanding. Lower grades represent further degrees of the above.

### **Overall Grading Scheme**

Lab hours, research progress, and lab conduct	20
Lab notebook	15
Presentation	5
Quizzes & Journal Club Q's	10
Mini assignments	5
Research Report on Target (Mid Semester)	15
Bi-Weekly Lab Postings	15
Final Research report	15
<b>Total</b>	<b>100%</b>

NOTE: Late assignments will lose **5%** of their total value per day

## **Organization**

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### **Materials**

Tubes, plates, boxes, notes, etc. must always be labeled appropriately or it may get discarded. In most cases you will use a short piece of colored tape to make a label. A complete label has the

following information: VDS, Name (or initials), Date, Exact contents, Concentration, Experiment designation or sample number. All items should be labeled on the top and side.

Ice (not for human consumption) and autoclaves can be found in PAI 1.03. You are allowed to get ice on your own but autoclaving will be done by the mentors, TA or RE.

### **Lab Safety Training**

As you will be working with less supervision this semester, you will need to be more responsible for your own safety. As a result, you will need to have taken three more safety classes than what you had in the Spring:

OH 207 (Biological Safety) – in person training

[https://utdirect.utexas.edu/tclass/rprofile.WBX?component=0&course\\_prefix=OH&course\\_number=207&command=RP](https://utdirect.utexas.edu/tclass/rprofile.WBX?component=0&course_prefix=OH&course_number=207&command=RP)

Sign up and take this as soon as possible.

FF 205 (Fire Extinguisher Training) – in person training

[https://utdirect.utexas.edu/tclass/rprofile.WBX?component=0&course\\_prefix=FF&course\\_number=205&command=RP](https://utdirect.utexas.edu/tclass/rprofile.WBX?component=0&course_prefix=FF&course_number=205&command=RP)

- You can just show up the day of, but make sure your name and UTEID get on the sign-in clipboard.

CW 512 (NIH Guidelines for recombinant DNA work) – Online slides & quiz. 60 min

[https://utdirect.utexas.edu/cts/class.WBX?s\\_course\\_comp=0&s\\_course\\_prefix=CW&s\\_course\\_number=0512](https://utdirect.utexas.edu/cts/class.WBX?s_course_comp=0&s_course_prefix=CW&s_course_number=0512)

After completion, verify your Personal Training History through this site on the left hand menu – under ‘Training History’. Print this out and place it in the Safety Training section of our sign-in folder in the lab.

<https://utdirect.utexas.edu/tclass/>

### **Safety & Waste Disposal**

We will handle organic solvents (some may be highly corrosive to human skin and tissues) and other potentially dangerous chemicals and items. Safe lab practices and waste disposal procedures are mandatory and will be taught to you. Unsafe, imprudent and careless activities will result in you being removed from the lab. Continued noncompliance will result in a reduced lab grade and/or course failure. Please report anything you see that is unsafe (confidentially) to the TA or mentors.

1. Know the nearest location and proper use of the fire extinguisher (by both doors), first-aid kit and chemical spill-kit (both under the nanopure), eye-wash (middle sink).
2. There must be at least 1 other safety trained personnel while working in the laboratory.
3. Immediately report any accidents or mishaps to the mentors, TA, or RE.
4. PPE (Personal Protective Equipment)
  - a. You are required to wear latex or nitrile gloves when performing experiments. Know when to use latex vs nitrile. Also, know the location of safety glasses (cabinet) and lab coats (hanging on closet door next to entrance). Wear these safety items at all times especially when working with hazardous chemicals (e.g. ethidium bromide, acrylamide, phenol).
  - b. Always wear closed toed shoes (NO SANDALS). If you do not have close toed shoes – you will need to wear protective booties (located in the gloves closet)



- c. Lab coats should be worn at all times and appropriate eye protection.
5. No food or beverages are allowed in the laboratory. PERIOD. Put any food outside on the hallway tables.
6. For your own safety and that of others, discard all waste appropriately:
  - a. Razor blades, needles, and other sharp METAL items should be placed in the Red plastic SHARPS containers – any of the three in lab.
  - b. Glass must be placed in white cardboard boxes labeled “For Glass Disposal”.
  - c. Certain chemicals (PAGE and Phenol/Chloroform) must be placed in labeled waste containers in the chemicals hood. There are separate containers for Acid and Base waste
  - d. Biologicals (bacteria) like LB agar plates must be placed in orange waste containers for autoclaving. Liquid cultures must be killed with 10% bleach for 20 min and disposed down the center sink drain.
7. Wash used glassware
  - a. Remove ink or tape labels with ethanol
  - b. Scrub items with sponge or bottle brush and warm soapy (Alconox) water.
  - c. Triple rinse with tap water until soap is gone.
  - d. Double rinse with distilled tap water.
  - e. Invert all items to dry on peg boards or other designated locations.
  - f. Once dry, replace to glassware cabinet.
8. The lab area should be as clean (or cleaner) when you leave, as it was when you arrived. Strive to clean up at least one other thing that is not yours (e.g. loose tips or tubes, or clean some glassware)

During certain laboratory exercises, you may be given special instructions regarding disposal of hazardous materials, chemical solutions such as organic solvent wastes, or biological material such as antibiotic-resistant bacteria. For your own safety and that of others, please follow these special directions carefully

**ALWAYS ASK QUESTIONS BEFORE YOU DO SOMETHING IF YOU ARE UNSURE!**

### Emergency Procedures

The following recommendations regarding emergency evacuation from the Office of Campus Safety and Security, [512-471-5767](tel:512-471-5767), <http://www.utexas.edu/safety/> :

- Occupants of buildings on The University of Texas at Austin campus are required to evacuate buildings when a fire alarm is activated. Alarm activation or announcement requires exiting and assembling outside.
- Familiarize yourself with all exit doors of each classroom and building you may occupy. Remember that the nearest exit door may not be the one you used when entering the building.
- Students requiring assistance in evacuation shall inform their instructor in writing during the first week of class.
- In the event of an evacuation, follow the instruction of faculty or class instructors.
- Do not re-enter a building unless given instructions by the following: Austin Fire Department, The University of Texas at Austin Police Department, or Fire Prevention Services office.
- Link to information regarding emergency evacuation routes and emergency procedures can be found at: [www.utexas.edu/emergency](http://www.utexas.edu/emergency)

## **BCAL**

Are you worried about a student in your class, bothered that your roommate has been acting differently, or concerned about the behavior of a co-worker? Do you have concerns but are not sure what to do? If so, contact the **Behavior Concerns Advice line** at:

512-232-5050 or [submit your concerns using the online form](https://www.utexas.edu/safety/bcal/)  
<https://www.utexas.edu/safety/bcal/>

## **Accommodations**

Please notify your instructors at the beginning of the semester of any modification/adaptation you may require to accommodate a disability-related-need. You will be requested to provide documentation to the Dean of Students' Office, in order that the most appropriate accommodations can be determined. Specialized services are available on campus through Services for Students with Disabilities (471-6259). <http://www.utexas.edu/diversity/ddce/ssd/>

## **Religious Holidays**

By UT Austin policy, you must notify me of your pending absence at least fourteen days prior to the date of observance of a religious holy day. If you must miss a class, an examination, a work assignment, or a project in order to observe a religious holy day, you will be given an opportunity to complete the missed work within a reasonable time after the absence

## **Appeals**

The Research Educator, TA and Mentors will make decisions concerning grades, attendance and other policy matters. Should you disagree with a TA or Mentor, you are welcome to take the matter to the RE.

## **Academic Integrity**

Policies for academic dishonesty are designed to help you and to be fair to the other individuals in the class. Scholastic dishonesty will not be tolerated. Being honest about your academic work is the foundation of your education. For this reason, cases of academic dishonesty will be regarded with the utmost seriousness whether this means copying someone else's Lab report or making up lab results. If quoting or paraphrasing from another source, please ask instructors, TA or mentors on the correct way to cite a reference. For a complete definition of unacceptable behavior, such as plagiarism, and the UT policy regarding such activities, see the Student Judicial Services website: [http://deanofstudents.utexas.edu/sjs/acint\\_student.php](http://deanofstudents.utexas.edu/sjs/acint_student.php).

UT Honor Code:

“The core values of the University of Texas at Austin are learning, discovery, freedom, leadership, individual opportunity, and responsibility. Each member of the University is expected to uphold these values through integrity, honesty, trust, fairness, and respect toward peers and community.”

There are few opportunities in life that allow you to take advantage of all of these values at once – the FRI is a unique program and I hope that you will get the most out of it. Enjoy your semester! – Dr. B